

were examined. Briefly it may be stated he found that if a spectrum was allowed to fall on a sensitised daguerrotype plate, which had received a preliminary exposure to white light, a remarkable phenomenon took place—a phenomenon which was also observable if weak white light were allowed to fall on the plate during its exposure to the solar spectrum. In developing such an image with mercury vapour, the blue, or most refrangible end of the spectrum was impressed in the usual way, that is to say, the Fraunhofer lines showed as dark lines on a lighter back-ground; at the red or least refrangible end of the spectrum, however, the Fraunhofer lines were seen as light on a darker back-ground; in other words, the photographic action was reversed, the neutral point of no action lying somewhere in the yellow. On studying a picture taken by this means, it was observed that in all cases the darkest Fraunhofer lines had the same tint, and that effect of light lines upon dark background, or dark lines upon the light background, were caused by alteration in tint of the background itself. Could this effect have anything to do with the oxidation? if it had it would indicate that the rays in the least refrangible end of the spectrum must *accelerate oxidation*; for it must be remembered that the plates had received an exposure to white light, either before, or during, exposure to the spectrum, and that the red rays prevented the development of the effect of the white light.

Now Draper had failed to get the same result on films of collodion containing the sensitive silver compounds, though he had obtained the reversal of the least refrangible end of the spectrum on such plates. If the theory

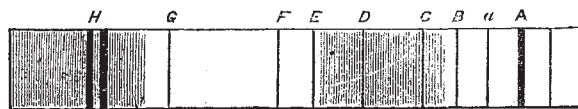


FIG. 3.

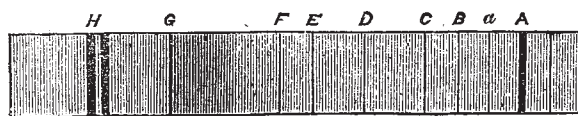


FIG. 4.

of oxidation held good for daguerrotype plates it ought also to hold good for the collodion films, and experiment decided once again in favour of the theory. Collodion films, which held *in situ* the blue form of silver bromide already alluded to, and which had been proved to be sensitive to the red end of the spectrum in the ordinary sense of the word (*i.e.*, that a proper negative picture of it could be obtained as it could of the blue end), were the subjects of experiment. It is evident, if the red rays were accelerators of oxidation, that in order to get a positive picture of the red end (*i.e.*, one answering to the reversal of the Fraunhofer lines in Draper's daguerrotype plates) the films should be exposed to the spectrum whilst in some oxidising medium, weak enough by itself, not totally to obliterate during the time of exposure to the spectrum any preliminary exposure which should be given to them, and yet strong enough to do so and to destroy the reducing action of the red rays, if these latter possessed a power of accelerating oxidation. Ozone, hydroxyl, nitric acid, and other oxidising agents, completely corroborated the idea that all the red rays had the power of accelerating oxidation, as the positive pictures of the red end here obtained, and in some case of the blue end, with negative pictures of the yellow and ultra-violet. The strength of the oxidising solutions was very small; thus, when nitric acid was used, four drops to a couple of ounces of water was found sufficient to cause this remarkable action to take place, whilst if the nitric acid were reduced in quantity, or omitted altogether,

the effect of the ordinary negative picture was obtained in that part of the spectrum (Figs. 3 and 4). On the other hand, when the strength was increased, the image disappeared altogether. Figs. 3 and 4 show the results indicated above; the shaded portions show where the spectrum was photographed in the usual way, the white portions indicate where the reversed action took place.

We are not sure but we believe that Draper used silver iodide as his sensitive salt in the experiments with collodion, in which he failed to obtain these phenomena. The iodide is insensitive to the red end of the spectrum under ordinary conditions of exposure, being usually exposed in the presence of a solution of silver nitrate which clings to it after taking it out of the bath. It was found, however, if this free silver nitrate were washed away and if the exposure to the spectrum took place in the oxidising medium, after a preliminary exposure to white light, that this reversing action, as it is called, of the red end of the spectrum was obtained; and under certain conditions if the silver nitrate were removed, that the same results could be obtained even when the plate was not exposed in this oxidising medium.

Now regarding the reversal in the blue indicated above how can it be accounted for? By the very same theory, only an abandonment of the hypothesis that the least refrangible end of the spectrum *alone* is an accelerator of oxidation becomes necessary. In all comparative experiments made with the daguerrotype plate and the collodion film the difference of these conditions must be remembered. In the former the halogen liberated by the action of the light on the iodide combines immediately with the metallic plate forming fresh sensitive compound; in the latter the thickness of the sensitive compound has a limit, and much of it is altogether inoperative, the outside of the particles alone being available for the reducing action of light, and the halogen has to escape or be absorbed as best it may. In a collodion film it is manifest that the reduction of all the sensitive compound available must take place after a time, and when this is the case, if the same rays which effect reduction likewise accelerate oxidation, that the latter effect of the rays will have unimpeded action. So much for the theory, does experiment prove or disprove it? It is evident if the hypothesis be correct, that a film which is exposed to the action of light in a medium free from oxygen, or in one which is an absorbent of oxygen, should be incapable, on development, of showing this reversal of the ordinary action of light.

The results again showed that the theory was borne out, for it was found impossible to obtain a reversal of the image when so exposed. Here, then, we have a probable explanation of the phenomenon known as solarisation, to which allusion has already been made; it seems to be an oxidation of the undeveloped image.

W. DE WIVELESLE ABNEY

(To be continued.)

NOTES

DR. O. FINSCH has resigned his appointment as Custos of the Museum of Bremen, and, as soon as the publication of his work on the results of the German Siberian Expedition of 1877 is completed, will leave Europe on a scientific mission to the Pacific and Australia. Dr. Ludwig, late Assistant in the Zoological Museum of Göttingen, has been appointed Dr. Finsch's successor.

WE notice the death at Cuenca, in Ecuador, on June 20, of Gustav Wallis, the botanist. He was born at Luneberg, in Detmold, May 1, 1830. In 1860 he was commissioned by the Lindens, the great horticulturists of Brussels, to gather new varieties of plants in South America, and during eight years, almost without cessation, he traversed Brazil, Peru, Ecuador,

Bolivia, Columbia, Panama, and Costa Rica, making everywhere enormous botanical collections. A similar journey to the Philippine Islands under the auspices of Veitch and Co., of London, followed in 1868, but in 1871 he was back again in his favourite field, the north-western portion of South America. Here he met his death in a hospital, reduced to poverty, and fairly worn out in the cause of science. Wallis stood fairly first among the travelling botanists of our day, possessing a rare combination of courage, energy, and scientific training. Not only were his contributions to botany of great value, but he actually introduced into European horticulture no less than 1,000 new varieties from across the ocean, and no small portion of the brilliant treasures of our modern conservatories are due to his unwearied zeal.

THE American Association met, under the presidency of Prof. O. C. Marsh, at St. Louis on August 21 and following days, and, judging from the reports that have reached us, the attendance was not quite up to the average, St. Louis having a bad reputation on account of its heat, this year aggravated by the dread lest the yellow fever might extend up the Mississippi Valley to the meeting-place of the Association. Vice-president Thurston gave the introductory address "On the Philosophic Method of the Advancement of Science," in which he traced the history of scientific research from early times, and advocated the establishment of a systematic method for discovering competent scientific writers, and endowing them adequately for the pursuit of research. Mr. A. R. Grote gave an address entitled "Education, a Succession of Experiences." Mr. Edison was present at the meeting for a short time and met with an enthusiastic reception; he read a paper on some of his inventions. A committee was appointed to arrange for a eulogy on the late Prof. Henry. We see from the neatly got-up *Daily Programme* of the Association that upwards of 100 papers were down to be read. We hope to give an account of the principal papers in an early number. The Association meets next year at Saratoga, on the last Wednesday of August, Mr. G. F. Barker of Philadelphia, president.

AT the recent International Congress of Anthropology several interesting reports were read by specially appointed reporters. M. Thulié gave a report on anthropological societies and education in anthropology. In tracing the history of anthropological societies in France and England, he showed the gradual progress which had been made in the objects and method of the science. M. Topinard's report was on astronomical, biographical, and pathological anatomy. He divided anthropology into general and special—the former embracing the human group as a whole and in its relation with the lower animals, the latter department being entitled "Zoological Anthropology;" special anthropology or ethnology investigates natural divisions, primitive or secondary, called *races*. Another division was into anatomical, biological, and pathological anthropology. Ethnographical reports were given by M. Girard de Rialle on Europe, Central and Western Asia, and America, and by M. Bordier on Africa, Eastern Asia, and Oceania. M. de Rialle called attention to the magnificent museums in the northern European countries, Sweden, Finland, and Russia, as contrasted with France, and still more markedly, we might say, with England. These reports were illustrated by reference to the fine collections shown at the Paris Exhibition. There were two reports in the department of prehistoric archaeology, one by M. de Mortillet on geological times, and the other by M. Cartailhac on the neolithic period. In the report on demography (a sort of statistical anthropology), by M. Chervin, he gave a beautiful example of a statistical study by Dr. Berg, of the Swedish Statistical Bureau, who traces the influences of the Swedish wars between 1795 and 1810, generation after generation down almost to the present

day. Dr. Lebon read an instructive paper on the results of his experimental researches on the variation of volume of the cranium in their relations to intelligence. He showed that intelligence was proportionate to the volume of the cranium, and that among the higher races the difference between the size of individual crania is less than among inferior races. A curious result is that among the women of the inferior races the cranium is generally larger than among those of the superior races; this result he ascribes to the insignificant part allotted to females in the active work of civilised society.

AMONG the resolutions passed by the International Congress on weights, measures, and coins, at Paris, was the following:—"The Congress learns with pleasure the progress of the metric system; it deplores that England, Russia, and the United States have not yet entered into the same path; and it is of opinion that the Governments of those countries should be solicited to give effect as early as possible to an act of progress so eminently useful to science, commerce, and international relations." The British and American members had a separate meeting, and resolved to petition their respective Governments to appoint a mixed Commission to consider the adoption of the metric system by both countries, and to make all necessary recommendations for the proper legislation to secure the desired end.

THE *Gazetta d'Italia* recounts a somewhat remarkable change in the surface of the earth at the village of Ortagli, a short distance south-east of Florence. In the course of a few days the tract on which the village stands has gradually sunk, until the depression amounts to about fifteen feet. It has not been sufficiently regular to prevent the houses from making threatening divergences from the perpendicular, and the population has taken refuge in the field. Strange to say another tract of land about two hundred yards from the village is, on the contrary, gradually rising, at times nearly rapid enough to be noticed with the eye. Several Italian *savants* are on the ground studying the strange phenomenon.

AT the next meeting of Russian Naturalists at St. Petersburg the question of chronology is again to be ventilated, with a view of proposing to the Government the change of date from the old style, now in use in Russia, to the new style used everywhere else in Europe and abroad.

ADMIRAL MOUCHEZ appointed two days every month when the Paris Observatory might be visited by the public, but the number of requests increase so much that he has been obliged to establish supplementary visits. On Saturday, September 7, the number of visitors exceeded a thousand. Admiral Mouchez intends giving a great *soirée* at the Observatory, on which occasion all the celestial objects drawn from nature by a clever artist will be shown with a magic lantern. He has asked from the Ministry of Public Instruction the loan of a portrait of Louis XIV., the founder of the Observatory. This portrait will be placed in the large saloon and surrounded by the portraits of Lalande, Laplace, Arago, Leverrier, and other great astronomers whose names have been associated with the establishment.

A COMMISSION was some time since appointed to report on the great reflector which Leverrier discovered to be imperfectly polished. The Commission has examined the instrument carefully, but unfortunately drawn up an ambiguous report, so that Admiral Mouchez is said to be left in a most perplexing position. The report does not say clearly that the instrument is good, but at the same time it gives no authority to reject it and to have it polished again. The perplexity is enlarged by the incoherence on the results of works in course of execution. The polishing of the glasses of the large refractor has been placed in the same hands in pursuance of a contract signed by Leverrier long ago. It is expected that at the next meeting the Council of the

Observatory will give to the director the means of protecting efficiently the interests of Government and science.

MOUNT VESUVIUS is showing visible signs of agitation. An overflow of lava is considered probable on the side towards the Observatory.

At a meeting of the Sunday Society a report was read from Mr. W. E. A. Axon, hon. secretary of the Manchester and Salford branch, announcing that, after a debate which had extended over three meetings, the City Council had, by a majority of 28 against 20, acceded to the memorial from the Sunday Society, and decided to open the several free libraries of the City on Sunday afternoons. Much satisfaction was expressed with Mr. Axon's report, and on the motion of Mr. Mark H. Judge, seconded by Mr. Frederick Long, a resolution was unanimously passed thanking the branch for the energy they have exhibited, and congratulating them upon the success they have achieved. The libraries were opened last Sunday for the first time.

ONE of the large monkeys at the Alexandra Palace had been for some time suffering from the decay of the right lower canine, and an abscess, forming a large protuberance on the jaw, had resulted. The pain seemed so great it was decided to consult a dentist as to what should be done, and, as the poor creature was at times very savage, it was thought that, if the tooth had to be extracted, the gas should be used, for the safety of the operator. Preparations were made accordingly, but the behaviour of the monkey was quite a surprise to all who were concerned. He showed great fight on being taken out of his cage, and not only struggled against being put into a sack prepared, with a hole cut for his head, but forced one of his hands out, and snapped and screamed, and gave promise of being very troublesome. Directly, however, Mr. Lewin Mosely, who had undertaken the operation, managed to get his hand on the abscess and gave relief, the monkey's demeanour changed entirely. He laid his head down quietly for examination, and, without the use of the gas, submitted to the removal of a stump and a tooth as quietly as possible.

THE *Daily News* Roman correspondent writes that from his villégiatura at Rocca di Papa, the archaeologist Prof. Michael Stephen de Rossi, sends to the *Voce della Verità* an account of the earthquake that occurred there on the 3rd inst. At 11.13 P.M. of that day the inhabitants of the village were aroused by the very distinct shock of an earthquake, which was at first jerking, then undulatory in its movement, in a north-west south-east direction. The jerking lasted three seconds, but the undulatory stage occupied a considerable interval of time. In the seismographs the jerking stage of the phenomena was very strongly registered. What merits attention is that this shock coincided with a rise of the barometer,—at the close, that is to say, of an atmospheric storm. It happened when the temperature had barely reached its maximum for the season, thereby coinciding with the phenomena that took place on August 24 of last year. This earthquake was not unforeseen, although it was the first very perceptible one of which they have had experience this season. Already from August 24 there happened slight shocks, and sometimes they were felt even in Rocca di Papa. The instruments, particularly the tronometer, were continually agitated. On September 3 between 11.30 A.M. and 12.30 P.M., Prof. de Rossi counted eleven slight shocks, the most perceptible of them being that which occurred at 12.10 P.M. It was jerking on the 4th, the instruments being agitated in the most extraordinary manner, principally at 11.40 A.M. and between 2 and 5 P.M., at which time he also noticed two very tiny shocks. In the interval between August 24 and September 6 there were also felt some subterranean murmurs, for the study of which

Prof. de Rossi did not, he regrets to say, put the microphone in operation. This wonderful instrument was scarcely dreamt of when he published his opinion that it could be applied to the observation of even the microphonic sounds which may accompany not only earthquakes but also microseismic movements. In fact, Count G. Mocenigo, of Vicenza, tried for the first time to apply it for this purpose, with the result of hearing the most mysterious sounds which are produced under our feet in the depths of the earth. Prof. de Rossi ventures on no speculation as to the continuance and close of the actual seismic period. It is certain, however, he states, that it is found in strict relation with the extraordinary drought, of which, perhaps, as in the past year, it is the result.

WE have received a neat and well-illustrated guide-book to the new aquarium which has been opened in Princes Street, Edinburgh, under the direction of Dr. Andrew Wilson. The institution is intended to be utilised for instruction as well as for amusement, and in winter it is Dr. Wilson's intention to deliver occasional lectures of a popular kind adapted especially for school-children, who will thus, it is hoped, be incited to study natural history practically, or at least to take some interest in their living surroundings. When the arrangements are thoroughly completed it is hoped that a naturalist's table and small laboratory may be instituted. The directors, we are informed, appear to encourage as far as possible the educational features of the institution. We trust the institution will prove a success, and turn out an important addition to the educational resources of Edinburgh.

WE understand that Messrs. Chatto and Windus have in the press a volume of Essays and Lectures on Biological Subjects, by Dr. Andrew Wilson, of the Edinburgh Medical School. The work, under the title of "Leisure Time Studies," will be fully illustrated; some of the more prominent essays dealing with the relations of science teaching to ordinary education.

MR. W. S. SONNENSCHNIGER will publish this year an English translation of Naegeli and Schwendener's well-known work, "Das Mikroskop. Theorie und Anwendung desselben," made by Mr. Frank Crisp, LL.B., B.A., Hon. Sec. to the Microscopic Society, and the publisher himself. The translation will be made from the last German edition, and will be supervised in part by Prof. Schwendener himself. The last chapter of the original (on Morphology) will be omitted, as having no reference to the microscope.

A GENEVA correspondent sends us a photograph showing the effects of lightning on an aspen (*Populus tremula*), situated in a wood near the Château of Crans on the shore of the Lake of Geneva. It was struck on August 9 last, in circumstances confirmatory of the views of Prof. Colladon (*NATURE*, vol. xvi. p. 568). The lightning chooses by preference the poplar as a conductor to reach the ground, and the case is striking here, where the tree is surrounded by other kinds, particularly firs, taller than it. Two great branches, of forty-five and fifty centimetres in diameter, which surmounted it, were struck by the lightning, and led it to the ground without having received the least apparent injury, while the trunk below them is absolutely shattered. This is a fresh proof that the upper part of trees, especially of poplars, is an excellent conductor of electricity, which only rends or shatters the wood when it finds a passage in the trunk. Other recent observations prove the preference of lightning for trees situated near streams or reservoirs of water, so that the best conductor for a house is a lofty tree, a poplar especially, situated between the house and a well, a pond, or a neighbouring stream.

AN interesting establishment was opened in the Champ de Mars, Paris, close to the École Militaire (within the precincts

of the Exhibition), a few weeks ago, and deserves notice. It is a technical library for French authors which now numbers more than 3,000 volumes. This library will be made permanent, and established somewhere in Paris when the Exhibition is over. It was originated by M. Tresca, the sub-director of the Conservatoire des Arts et Métiers.

THE weather being magnificent in Paris, the Giffard captive balloon takes up daily 500 passengers, paying twenty francs each, exclusive of a large number of *invités*, two aeronauts, and meteorological observers. M. Giffard has received propositions from the New York *Daily Graphic* for the purchase of his balloon, but he has declined; it will probably become a permanent institution in Paris.

THE Russian Technical Society at St. Petersburg has commenced the publication of polyglot technical dictionaries. The French-Russian-German-English part has just appeared.

THE rage for exhibitions has now spread even to Central Asia. The latest news from Tashkent states that an agricultural and industrial exhibition is about to be held there. Great preparations are being made for it at Samarcand, and the Government has promised gold and silver medals to the exhibitors as well as —honorary Kaftans!

WE recommend to all who have anything to do with the management of schools, two lectures by Dr. Liebreich, which have been published by Messrs. Churchill under the title of "School Life in its Influence on Sight and Figure."

THE botanist Fournier finds in Mexico 638 varieties of grasses, of which 376 occur in no other land. Of the remainder 82 are found in the United States, 30 on this side of the Atlantic, and the rest in the West Indies, South and Central America.

DR. AHLBERG describes, in Neubert's *Deutsches Magazin*, the Japanese flora as being at the height of its beauty in May. None of the great families is without its representatives, although as usual the Cruciferae, Compositae, Papilionaceae, Ranunculaceae, and Umbelliferae predominate. The forests are marked by a variety of maples, numerous representatives of the oak, and a large number of varieties of ilex.

UNDER the title of "African Poisons" the *Journal of Applied Science* for the current month has some notes on the poisonous properties of a species of *Strychnos* and on the Inée poison (*Strophanthus hispidus*). Regarding the former it seems to be employed as an ordeal by the natives in Gaboon under the names of "Cusa" or "Icaja," and at Cape Lopez by that of "M'boundou." The plant producing it is described as growing in swampy or inundated situations, and attaining a height of only from four to six feet. The root is long and tapering, and is covered with a red bark, and it is from this bark that the active principle is obtained. The root-bark is scraped off and steeped in about a quart of water. When the water has acquired a reddish colour the poison is ready. According to the recent investigations of Messrs. G. Picholier and C. Saint Pierre the toxic principle of M'boundou is soluble in water and alcohol, and has a mode of action analogous to nuxvomica, that is to say, acting on the sensitive nervous system. It only in a secondary degree affects the active nervous system. It is suggested in the article from whence the above information is obtained that it would be interesting to compare the M'boundou with the hoang-nan (*Strychnos gauthieriana*) of Cochin China, which is employed in cases of leprosy and hydrophobia.

IN the British Section of the Paris Exhibition, amongst scientific instrument makers, the gold medal has been awarded to Messrs. A. Lége and Co., for their exhibit of instruments of precision and for the improvement of navigation.

WE learn that Parts I. and II. of Mr. Buchanan's work on "The Grasses of New Zealand," which is being published in

the colony is on the eve of publication if it has not already appeared. These two parts contain twenty-one plates. The volume is large quarto and when completed will consist of five parts, and will contain fifty-five plates all native printed. It is said that Dr. Hector intends to bring out a reduced edition in octavo with the plates reduced by photo-lithography, and tinted. In this form it will be more handy and convenient than the original bulky volume.

THE Paris mint has published statistics on the value of pieces struck in the establishment from 1795, the date of its foundation, to 1878:—In gold, about 8,500,000,000 francs; in silver, about 5,510,000,000 francs; in copper, about 62,702,785 francs. Total value, 14,072,702,785 francs.

PROGRESS OF THE "CHALLENGER" REPORT¹

AS a period of more than two years has now elapsed since the return of the *Challenger* expedition, I may very properly be expected to give some account to my scientific brethren of the progress which has been made up to the present time in the reduction and classification of the multitude of observations which were made in different departments, in the description and illustration of the natural history collections, and in the preparation of the official record of the voyage, which has been called for by government.

Before doing so, however, it may be well for me to sketch briefly the circumstances which led to the adoption of the plan now in operation for working up the results of the expedition, and putting them in a permanent form.

The voyage of the *Challenger* was undertaken for a very definite purpose, the determination of the physical and biological conditions of the ocean, and as the period of three years and a half occupied by our cruise round the world was quite too short even to draw the first outline sketch of general deep-sea conditions, our time was entirely devoted while the ship was at sea to registering observations, and cataloguing, and labelling, and storing specimens. Owing to the great liberality of the government in supplying abundantly all the necessary materials and appliances, an enormous collection of marine animals was sent home from time to time in wonderfully good condition. It was a matter of distinct understanding when I undertook the scientific direction of the expedition, that the responsibility not only of the conduct of the scientific work during its progress, but of the working out of its results at its close rested with me, and before the end of this cruise I was called upon by the Lords Commissioners of the Admiralty for a statement for their consideration of the course which I proposed to pursue both with regard to the publication of the results, and the ultimate destination of the specimens and other materials. Of course I had given this matter much careful thought, and I was in a position to submit to their lordships a general plan which commended itself to their approval, and which is now in process of being carried out unaltered. I proposed that for the time the collection should be placed in rooms which were given to us for the purpose in the University of Edinburgh, and that for the first year our attention should be chiefly directed to the preparation of an outline of the general report, and to the examination of the collection and its rough classification in zoological sequence; and that during this period the services of the gentlemen who had been associated with me on the scientific staff on board should be retained. I proposed that as soon as possible arrangements should be made to invite gentlemen who were recognised as authorities in different departments, and who had sufficient leisure at their disposal, to undertake the description of the zoological series, group by group, and that a sufficient sum should be granted to defray the expense of complete illustration and to compensate them to a certain extent for their expenditure of time.

With regard to the destination of the collection, I proposed that in the first place each specialist who undertook the description of a group should be requested to set aside all unique specimens

¹ "On the Progress which has been made in the Preparation of the Official Report of the *Challenger* Expedition." Paper read at the Dublin meeting of the British Association by Prof. Sir C. Wyville Thomson. Revised by the Author.